淡江大學九十學年度碩士班招生考試試題

系別：資訊管理學系　　科目：資料結構

准帶項目請打「○」否則打「×」	
計算機	字典
×	×

1. Please list the special features of the representation of the expression in postfix notation compared to in infix notation. (10%)

2. Quick sort is a good sorting method and a recursive function quicksort is used to sort the list (30, 5, 37, 10, 50, 65, 2, 27, 8, 42, 19). Please give the intermediate result after each step (or at each call of the function quicksort). The first number in the list or the sub-list is chosen as the pivot key. (15%)

3. (a) Give the definition of the max heap.
   (b) Ten integers are inserted into an empty max heap in the following order. Please draw the final max heap. The properties of the max heap must be kept after each integer is inserted.
   8 12 6 30 23 24 5 33 61 15 (15%)

4. The quadtree is a data structure for representing image in the area of image processing. It is defined as follows. There is a root in the quadtree and each nonterminal node has either four or no children. It is assumed that there are T terminal nodes in the tree. Please prove that the number of nodes (including the terminal and nonterminal nodes) in the tree is (4 * T – 1) / 3. (15%)

5. With the following declaration for the nodes in the linked binary tree t,

```
typedef struct node * tree_pointer;
typedef struct node {
        int data;
        tree_pointer left_child, right_child;
        };
```

give a recursive function treeheight(tree_pointer t) that will find and return the height of the tree t, where an empty tree is considered to have height 0 and a tree with only one node has height 1. (Note: no global variable is allowed and t is the pointer to the root) (15%)

6. There are m jobs for n persons to accomplish. Each job requires t persons, where t <= n. Initially, every person chooses his or her own k jobs he or she prefers. However, only r jobs of the k jobs are assigned to each person finally, where r <= k. Ideally, every person has the same number (which is r) of jobs to do. Please give the best algorithm (in pseudo code) for obtaining the assignment you can think of and explain it. Also, state the related discussion and your observation and comments about this problem. Please make your answer as clear and simple as possible. (30%)